

What Is Claimed Is:

1. A high stability, low emission, invert  
fuel emulsion composition for an internal combustion  
5 engine comprising  
purified water;  
hydrocarbon petroleum distillate fuel as the  
continuous phase of the emulsion;  
and  
10 a surfactant package comprising primary  
surfactant, block copolymer, and polymeric dispersant.

2. The invert fuel emulsion composition of  
claim 1 comprising 5-50 wt % purified water and 50-95  
15 wt. % hydrocarbon petroleum distillate fuel.

3. The invert fuel emulsion composition of  
claim 1 comprising at least 4000 ppm primary  
surfactant.  
20

4. The invert fuel emulsion composition of  
claim 3 wherein said primary surfactant is an amide.

5. The invert fuel emulsion composition of  
25 claim 4 wherein said primary surfactant is selected  
from the group consisting of unsubstituted, mono- and  
di-substituted amides of saturated  $C_{12}$ - $C_{22}$  fatty acids  
and unsubstituted, mono- and di-substituted amides of  
unsaturated  $C_{12}$ - $C_{22}$  fatty acids,

30 wherein said mono and di substituted amides  
are substituted by substituents  
selected, independently of each other, from  
the group consisting of straight and branched,  
unsubstituted and substituted alkyls having 1 to 4  
35 carbon atoms, straight and branched, unsubstituted and

substituted alkanols having 1 to 4 carbon atoms, and aryls.

5        6.    The invert fuel emulsion composition of claim 5 wherein said primary surfactant is a 1:1 fatty acid diethanolamide of oleic acid.

10       7.    The invert fuel emulsion composition of claim 1 comprising from about 1,000 ppm to about 5,000 ppm block copolymer.

10       8.    The invert fuel emulsion composition of claim 7 wherein said block copolymer is an EO/PO block copolymer.

15       9.    The invert fuel emulsion composition of claim 8 wherein said block copolymer is selected from the group consisting of PLURONIC 17R2, PLURONIC 17R4, PLURONIC 25R2, PLURONIC L43, PLURONIC L31, AND PLURONIC L61.

20       10.   The invert fuel emulsion composition of claim 9 wherein said block copolymer is octylphenoxypolyethoxyethanol (PLURONIC 17R2).

25       11.   The invert fuel emulsion composition of claim 1 comprising about 100 ppm to about 1,000 ppm polymeric dispersant.

30       12.   The invert fuel emulsion composition of claim 11 wherein said polymeric dispersant is ICI HYPERMER E-464.

13.    The invert fuel emulsion composition of claim 1 comprising

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10-50% purified water;  
50-90% hydrocarbon petroleum distillate fuel;  
at least 4000 ppm amide primary emulsifier;  
between about 2000 and about 3000 ppm EO/PO  
5 block polymer; and  
between about 600 and about 800 ppm polymeric  
dispersant.

10 *Sub AP* 14. The invert fuel emulsion composition of  
claim 13 wherein said amide primary surfactant is  
Schercomid SO-A (Scher Chemical).

15 *Sub AP* 15. The invert fuel emulsion composition of  
claim 13 wherein said block copolymer is Pluronic 17R2  
(BASF).

20 16. The invert fuel emulsion composition of  
claim 13 wherein said polymeric dispersant is Hypermer  
E-464 (ICI).

17. The invert fuel emulsion composition of  
claim 1 said emulsion having an average droplet size of  
less than about 5 microns.

25 18. The invert fuel emulsion composition of  
claim 17 said emulsion having an average droplet size  
of about 1 micron or less.

30 19. The invert fuel emulsion composition of  
claim 18 said emulsion having an average droplet size  
ranging from about 0.1 microns to about 1 micron.

35 *Sub AP* 20. An additive package for use in a fuel  
emulsion comprising primary surfactant, block  
copolymer, and surfactant stabilizer.

21. The additive package of Claim 20 comprising about 3,000 to about 10,000 parts per million of said fuel emulsion of primary surfactant.

5           22. The additive package of Claim 21 comprising about 5,000 to about 6,000 parts per million of said fuel emulsion of primary surfactant.

10           23. The additive package of claim 20 wherein said primary surfactant is an amide.

15           24. The additive package of claim 22 wherein said primary surfactant is selected from the group consisting of unsubstituted, mono- and di-substituted amides of saturated  $C_{12}$ - $C_{22}$  fatty acids, unsubstituted, mono- and di-substituted amides of unsaturated  $C_{12}$ - $C_{22}$  fatty acids, and mixtures thereof,

20                 wherein said mono and di substituted amides are substituted by substituents selected, independently of each other, from the group consisting of straight and branched, unsubstituted and substituted alkyls having 1 to 4 carbon atoms, straight and branched, unsubstituted and substituted alkanols having 1 to 4 carbon atoms, and  
25                 aryls.

30           25. The additive package of claim 22 wherein said primary surfactant is a 1:1 fatty acid diethanolamide of oleic acid.

26. The additive package of Claim 20 comprising about 1,000 to about 5,000 parts per million of said fuel emulsion of block copolymer.

5                    28. The additive package of claim 20 wherein  
said block copolymer is an EO/PO block copolymer.

30. The additive package of claim 29  
15 wherein said block copolymer is Pluronic 17R2.

20                    32. The additive package of claim 20 wherein  
said surfactant stabilizer is comprised of one or more  
components selected from the group consisting of  
polymeric dispersants, wetting agents, amine oxides,  
bio-polymer surfactants, amine othoxilates, and  
25    dinonylphenol ethoxylates.

33. The additive package of claim 32 wherein said surfactant stabilizer comprises about 100 to about 1,000 parts per million of said fuel emulsion of polymeric dispersant.

34. The additive package of claim 33 wherein  
said surfactant stabilizer comprises about 600 to about  
800 parts per million of said fuel emulsion of  
polymeric dispersant.

*Sub*  
35. The additive package of claim 33 wherein said surfactant stabilizer is Hypermer E464 (ICI) or Hypermer A-60 (ICI).

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36. The additive package of claim 32 wherein said wetting agent is comprised of Surfina 104 (Air Products).

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37. The additive package of claim 32 wherein said dinonylphenol ethoxylate is IGEPA 430.

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38. The additive package of claim 32 wherein said amine othoxilate is Ethamine T12 (Okzo).

39. The additive package of claim 20 further comprising an antifreeze.

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40. The additive package of claim 39 wherein said antifreeze is an organic alcohol.

41. The additive package of claim 40 wherein said antifreeze is methanol.

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42. The additive package of claim 20 further comprising an ignition delay modifier.

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43. The additive package of claim 42 wherein said ignition delay modifier comprises one or more compounds selected from the group consisting of nitrates, nitrites and peroxides.

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44. The additive package of claim 43 wherein said ignition delay modifier comprises 2-ethylhexylnitrate.

**Abstract**